specifications for the pulse dialing (also called decadic dialing) transitions and spark quenching presented to the telephone line. In general, pulse dialing comprises a repetitive series of on-hook and off-hook transitions. Figure 1 shows the standard two-wire public network lines, the TIP line 8 and the RING line 6. The TIP line and the RING line may be conventionally connected to a diode bridge 11. The diode bridge presents the proper polarity line signal to the hookswitch circuit 12 independent of the TIP and RING polarity. The hookswitch circuit 12 operates as a switch to "seize" or "collapse" the TIP and RING phone lines to allow the maximum loop current (I_{loop}) that is available from the phone line to flow. In an on-hook condition (i.e. the user is not transmitting data to or from the phone line), the hookswitch circuit 12 may be switched open. In an off-hook condition, the hookswitch circuit 12 may be switched closed to allow a loop current flow I_{LOOP}. The remaining DAA circuitry is shown as block 10. The phone company exchange is connected to the other side of the TIP and RING lines and may be characterized as a voltage source 16, an inductor 14 have an inductance L and a resistor 13. As the hookswitch opens and closes, the loop current flow I_{LOOP} will change and the voltage across the inductor 14 will change.

On page 6, please replace the paragraphs from lines 22-26 with the following:

a2

Figure 2 is a general block diagram of digital DAA circuitry including phone line side circuitry, an isolation barrier, and powered side circuitry according to the present invention.

Figure 2A is a block diagram of a telephone set illustrating a typical application of the present invention.

On page 7, please replace the paragraphs from lines 1-4 with the following:

a3

Figures 4A, 4B and 4C are general circuit diagrams of digital DAA circuitry implemented with two integrated circuits (ICs), a capacitive isolation barrier, and external circuitry according to the present invention.

Figure 5 is a conceptual diagram of a circuit according to the present invention.

On page 17, please replace the paragraphs from lines 4-7 with the following:

a4

The current through current source 502 does not have to be completely ramped down prior to the opening of the hookswitch 500. Rather, the current need only be dropped to a level sufficiently low so that the current change (di/dt) when the hookswitch 500 opens does not exceed a level that results in the failure to meet pulse dialing and spark quenching specifications.

On page 17, please replace the paragraph beginning on line 18 with the following:

a5

Example circuitry for achieving a current ramp when transition from off-hook to on-hook conditions in shown in Figure 6. Figure 6 illustrates the phone line side DAA integrated circuit 1802B and the surrounding external hookswitch circuitry using the same nomenclature and circuit connections as shown in Figure 4. As seen in Figure 6, the TIP and RING lines are provided to the diode bridge 1820. The diode bridge is coupled to the phone line side DAA integrated circuit 1802B through the hookswitch circuitry which includes transistors Q1, Q2, Q3 and Q4 and associated resistors. The hookswitch circuitry shown herein is merely exemplary, and many other hookswitch circuits may utilize the techniques of the present invention. The phone line side DAA integrated circuit 1802B is indicated by the dashed line and includes input/output pins QE, QB, QE2, IGND, FILT, FILT2 and REF. The DAA integrated circuit 1802B includes an I_{HOOK} current source 600, an I_{DCT}' current source 604, an I_{CHIP} current source 606 and an I_{QB} current source. The current I_{HOOK} operates to control the activation of transistor Q2. When the current I_{HOOK} is zero the hookswitch is in an on-hook state and transistor Q2 is off. When the current I_{HOOK} is on, transistor Q2 is activated and current flows through Q2. When the current I_{HOOK} is large enough (for example approximately 4 mA), transistor Q2 is in saturation and the hookswitch is in the off-hook mode. During off-hook conditions, the loop current is the sum of the currents I_{HOOK}, I_{DCT}, I_{DCT}', I_{QB}, and I_{CHIP}. As will be described below, the current I_{DCT}' is created by current mirroring (32X) the current I_{DCT}. In off-hook conditions, I_{QB} is similar in magnitude to the current I_{DCT}. The current I_{CHIP} represents all other currents drawn on chip. The I_{HOOK} current is related to the currents I_{DCT}, I_{DCT}', and I_{QB} as described below in more detail.

On page 18, please replace the paragraph beginning on line 18 with the following:

a6

Circuitry for ramping down the currents I_{DCT}', I_{CHIP}, and I_{HOOK} may be seen with respect to Figures 7, 8, and 9 respectively. As shown in Figure 7, the current I_{DCT}' may be generated by use of current mirror transistors 706, 705, and 708 which are sized to provide a current I_{DCT}' that is 32 times the current I_{DCT}. During off-hook operation the switch 704 is closed and the switch 702 is opened. Connected to switch 704 is a large resistance resistor 712 (2 MΩ) and connected to switch 702 is a smaller resistance resistor 714 (400 KΩ). Switch 704 is connected to the FILT pin of the phone line side DAA integrated circuit 1802B and switch 702 is coupled between the FILT pin and the QE2 pin as shown. A diode connected transistor 720 may be connected to the resistor 714 as shown. Coupled between the FILT pin and the QE2 pin is an external capacitor C12. As shown in Table 1, C12 may have a capacitance of 0.22 uF. As mentioned above, in the steady-state off-hook operation switch 702 is open and 704 is closed. This provides a path to the gate of transistor 708 to generate the 32X mirror current through transistor 708. When a transition to an on-hook state is signaled to switches 704 and 702 (such as for example by an on-hook control signal 504 as shown in Figure 5), switch 704 is opened and switch 702 is closed. This will result in a change in the gate voltage of transistor 708 (and thus correspondingly the current I_{DCT}') that is dependent upon the time constant of the internal resistor 714 and the external capacitor C12. The di/dt of the current I_{DCT}' is therefore affected by the values chosen for the resistor 714, transistor 720 and the capacitor C12.

On page 19, please replace the paragraph at lines 5-21 with the following:

a7

Similarly, the I_{CHIP} may be ramped down as shown in Figure 8. As shown in Figure 8, a Vc supply voltage level is provided to the phone line side DAA integrated circuit 1802B at the QE2 pin. Coupled between the FILT2 pin and the QE2 pin is an external capacitor C13 (for example 0.47 uf as shown in Table 1). Coupled to Vc is a plurality of p-channel chip bias transistors 802 which provide bias currents to the various circuits of the phone line side DAA integrated circuit 1802B. These bias currents together result in the current I_{CHIP}. During off-hook operation, the switch 806 is closed and the switch 804 is opened. Coupled to switch 806 is an internal resistor 808 (for example 500 KΩ) and coupled to switch 804 is an internal resistor 810